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TITLE: RUBBING APPARATUS AND LIQUID CRYSTAL DISPLAY DEVICE
MANUFACTURED BY USING THE SAME

PUBN-DATE: May 21, 2003

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ABSTRACT:

PROBLEM TO BE SOLVED: To provide a rubbing apparatus where a defective rubbing does occurs even in the case of performing an oblique rubbing to a liquid crystal substrate where a vertical alignment layer is formed and to provide a liquid crystal display device manufactured by using the rubbing apparatus.

SOLUTION: In the rubbing apparatus 10 having a rubbing stage 11 which can be moved and in which the liquid crystal substrate 12 with the alignment layer arranged thereon, and a rubbing roller 13 holding rubbing material on the outer periphery of a cylindrical rotated the liquid crystal substrate 12 with the edges around the substrate surface tilted by 1° to 45° with respect to the vertical direction 14 of its moving direction, is arranged. In the rubbing apparatus 10, the rubbing roller 13 is rotated in the same direction as the moving direction A of the rubbing stage 11 at a position where the liquid crystal substrate 12 is in contact with the rubbing material. Otherwise, a dummy substrate having a side surface on the side of the liquid

crystal substrate in contact with two edges to be arranged on the front side of the moving direction of the liquid crystal substrate among the edges and a side surface on the side of a tip including an edge in a direction nearly coincident with the vertical direction of the moving direction is arranged.

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(a) の切断面線 V I - V I から見た断面図である。

【図18】図18 (a) は、ラビング時におけるローラに対する基板配置の一の構成を示す平面図である。図18 (b) は、ラビング時におけるローラに対する基板配置の他の構成を示す平面図である。

【図19】図19 (a) は、図18 (a) の基板配置で発生するローラの毛先の捩れ方向を模式的に示す平面図である。図19 (b) は、図18 (b) の基板配置で発生するローラの毛先の捩れ方向を模式的に示す平面図である。

【図20】順回転のローラ回転によるラビング状態を説明するための断面図である。

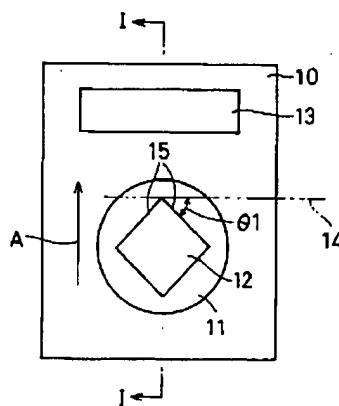
【図21】図20 (a) に示すラビング材と液晶基板112とが接触する位置120付近を拡大して示す図である。

【図22】垂直配向セルにおける視野角特性の一例を示す等コントラスト曲線図である。

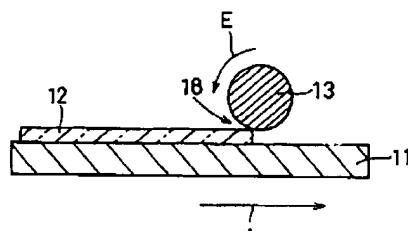
【符号の説明】

- 10 ラビング装置
- 11 ラビングステージ
- 12 液晶基板
- 13 ラビングローラ
- 14 液晶基板の移動方向の垂直方向
- 15 液晶基板の一辺

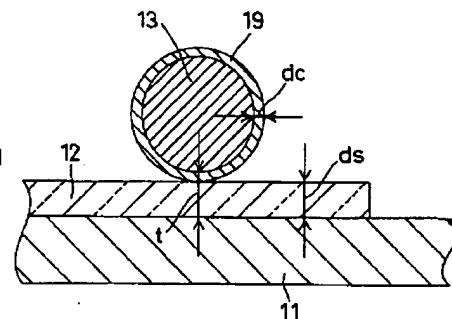
【図1】



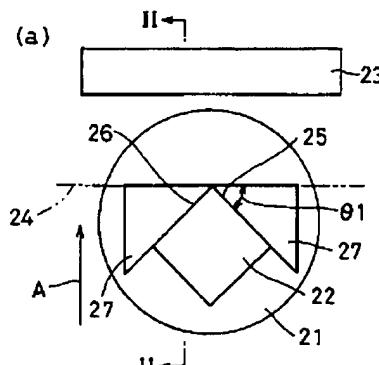
【図2】



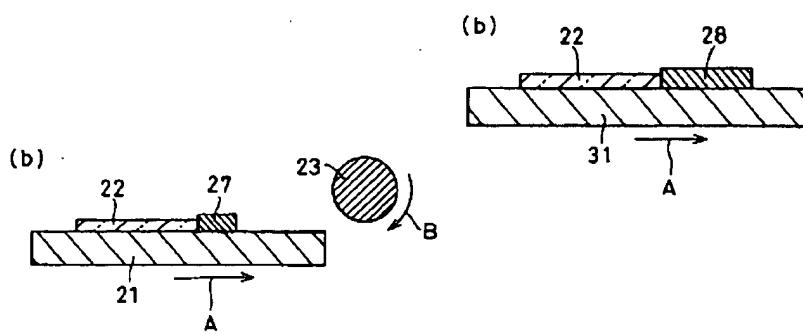
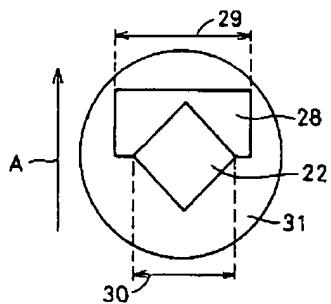
【図3】



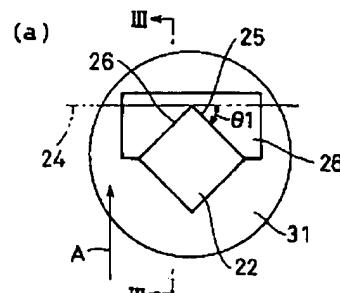
【図4】



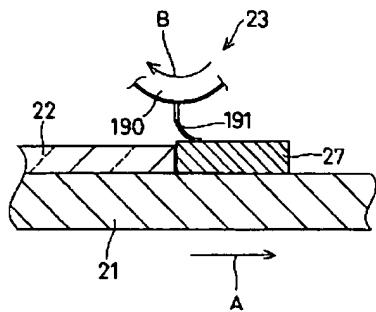
【図7】



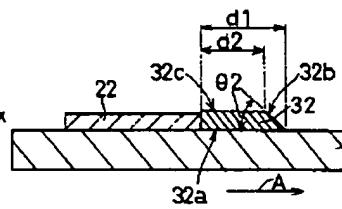
【図6】



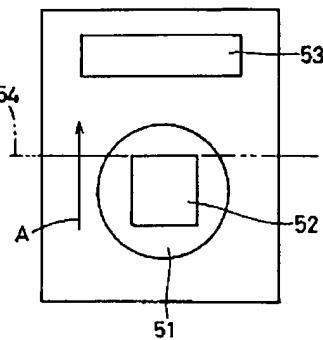
〔図5〕



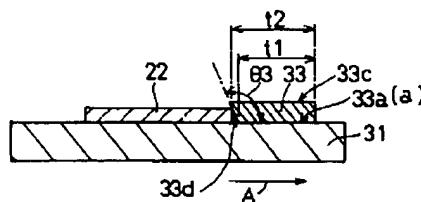
[図8]



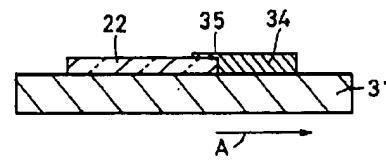
【図14】



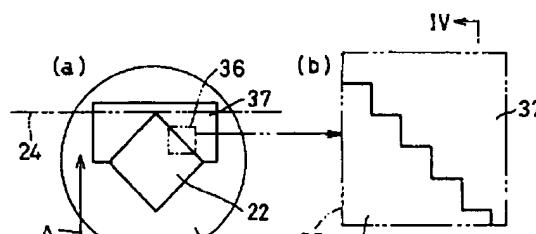
【図9】



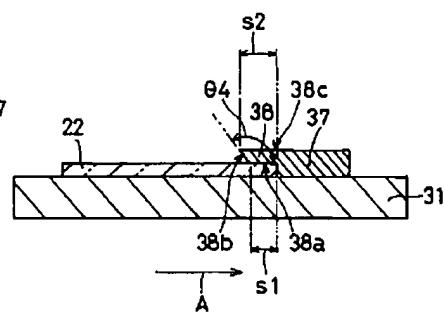
【図10】



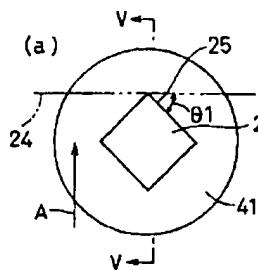
【図11】



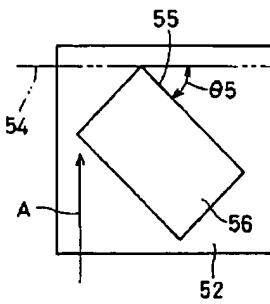
[図12]



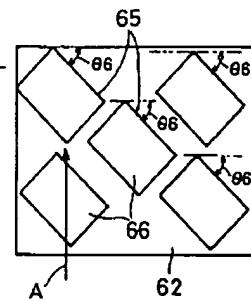
【図13】



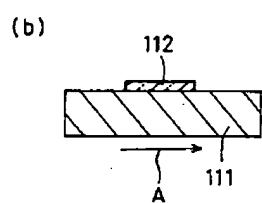
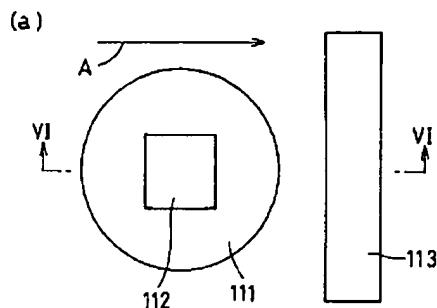
【图15】



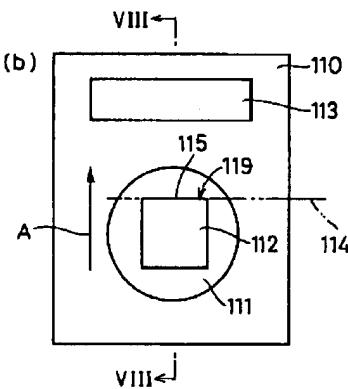
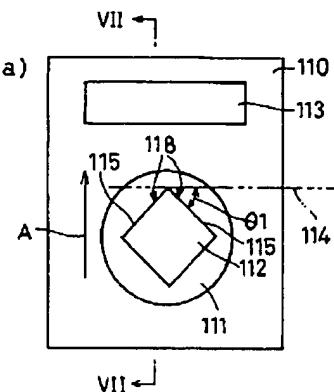
【図16】



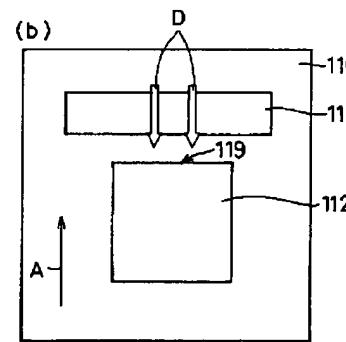
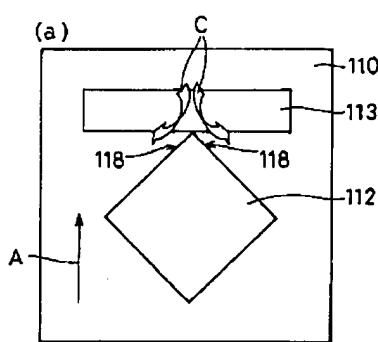
【図17】



【図18】



【図19】



【図20】

